MATHEMATICS STANDARD ARTICULATED BY GRADE LEVEL

GRADE 2

Strand 1: Number Sense and Operations

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Number Sense
Understand and apply numbers, ways of representing numbers, the relationships among numbers and different number systems.

PO 1.   Make a model to represent a given whole number 0 through 999.

PO 2.   Identify a whole number represented by a model with a word name and symbol 0 through 999.

PO 3.   Count aloud, forward or backward, in consecutive order (0 through 999).

PO 4.   Identify whole numbers through 999 in or out of order.

PO 5.   Write whole numbers through 999 in or out of order.

PO 6.   State equivalent forms of whole numbers using multiples of 10 through 1,000 (430 + 200 = 600 + 30).

PO 7.   State verbally whole numbers, through 999, using correct place value (e.g., A student will read 528 as five hundreds, two tens, and eight ones.).

PO 8.   Construct models to represent place value concepts for the one's, ten's, and hundred's places.

PO 9.   Apply expanded notation to model place value through 999 (e.g., 378 = 3 hundreds + 7 tens + 8 ones).

PO 10.   Identify odd and even (including 0) whole numbers through 999.

PO 11.   Compare two whole numbers through 999.

PO 12.   Use ordinal numbers.

PO 13.   Order three or more whole numbers through 999 (least to greatest or greatest to least).

PO 14.   Make models that represent given fractions (halves and fourths).

PO 15.   Identify in symbols and words a model that is divided into equal fractional parts (halves and fourths).

PO 16.   Count money through $5.00 using manipulatives and pictures of bills and coins.

PO 17.   Identify the value of a collection of money using the symbols ¢ and $ through $5.00.

PO 18.   Use decimals through hundredths in contextual situations with money.

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PO 19. Compare two decimals using money, through hundredths, using models, illustrations, or symbols.

PO 20. Distinguish the equivalency among decimals, fractions and percents (e.g., half-dollar = 50¢ = 50%).

Concept 2: Numerical Operations
Understand and apply numerical operations and their relationship to one another.

PO 1.   Demonstrate the process of addition through two three-digit whole numbers, using manipulatives.

PO 2.   Demonstrate the process of subtraction using manipulatives with two-digit whole numbers.

PO 3.   State addition and subtraction facts.

PO 4.   Add one- and two-digit whole numbers with regrouping.

PO 5.   Subtract one- and two-digit whole numbers with regrouping.

PO 6.   Add 3 one- or two-digit addends.

PO 7.   Select the grade-level appropriate operation to solve word problems.

PO 8.   Solve word problems using addition and subtraction of two 2-digit numbers, with regrouping AND two 3-digit numbers without regrouping.

PO 9.   Count by multiples of three.

PO 10. State multiplication facts: 2s, 5s and 10s.

PO 11. Demonstrate the associative property of addition [e.g., (3 + 5) + 4 = 3 + (5 + 4)].

PO 12. Apply grade-level appropriate properties to assist in computation.

PO 13. Apply the symbols: +, -, x, ÷, =, ≠, <, >, **%**.

PO 14. Use grade-level appropriate mathematical terminology.

PO 15. Demonstrate addition of fractions with like denominators (halves and fourths) using models.

PO 16. Demonstrate subtraction of fractions with like denominators (halves and fourths) using models.

PO 17. Add and subtract money without regrouping using manipulatives and paper and pencil, through $5.00.

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Concept 3: Estimation
Use estimation strategies reasonably and fluently.
PO 1.   Solve problems using a variety of mental computations and reasonable estimation.
PO 2.   Estimate the measurement of an object using U.S. customary standard and non-standard units of measurement.
PO 3.   Compare an estimate to the actual measure.
PO 4.   Evaluate the reasonableness of an estimate.

Strand 2: Data Analysis, Probability, and Discrete Mathematics

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Concept 1: Data Analysis (Statistics)
Understand and apply data collection, organization and representation to analyze and sort data.
PO 1.   Formulate questions to collect data in contextual situations.
PO 2.   Make a simple pictograph or tally chart with appropriate labels from organized data.
PO 3.   Interpret pictographs using terms such as most, least, equal, more than, less than, and greatest.
PO 4.   Answer questions about a pictograph using terms such as most, least, equal, more than, less than, and greatest.
PO 5.   Formulate questions based on graphs, charts, and tables.
PO 6.   Solve problems using graphs, charts, and tables.

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Concept 2: Probability
Understand and apply the basic concepts of probability.
PO 1.   Name the possible outcomes for a probability experiment.
PO 2.   Predict the most likely or least likely outcome in probability experiments (e.g., Predict the chance of spinning one of the 2 colors on a 2-colored spinner.).
PO 3.   Predict the outcome of a grade-level appropriate probability experiment.
PO 4.   Record the data from performing a grade-level appropriate probability experiment.
PO 5.   Compare the outcome of an experiment to predictions made prior to performing the experiment.
PO 6.   Compare the results of two repetitions of the same grade-level appropriate probability experiment.

Concept 3: Discrete Mathematics – Systematic Listing and Counting
Understand and demonstrate the systematic listing and counting of possible outcomes.
PO 1.   Make arrangements that represent the number of combinations that can be formed by pairing items taken from 2 sets, using manipulatives (e.g., How many types of sandwiches can one make with 3 different types of fillings and 2 types of bread if only one type of bread and 1 kind of filling is used for each sandwich?).

Concept 4: Vertex-Edge Graphs
Understand and apply vertex-edge graphs.
PO 1.   Color pictures with the least number of colors so that no common edges share the same color (increased complexity throughout grade levels).

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Strand 3: Patterns, Algebra, and Functions

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Concept 1: Patterns
Identify patterns and apply pattern recognition to reason mathematically.
PO 1. Communicate a grade-level appropriate pattern, using symbols or numbers (e.g., ∇, O, Δ, ∇, O, Δ, ∇, ___, ___, ___).
PO 2. Extend a grade-level appropriate repetitive pattern (e.g., 12, 22, 32, ___, ___, ___).
PO 3. Create grade-level appropriate patterns.

Concept 2: Functions and Relationships
Describe and model functions and their relationships.
PO 1. Describe the rule used in a simple grade-level appropriate function (e.g., T-chart, input/output model, and frames and arrows).

Concept 3: Algebraic Representations
Represent and analyze mathematical situations and structures using algebraic representations.
PO 1. Use variables in contextual situations.
PO 2. Find the missing element (addend, subtrahend, minuend, sum, and difference) in addition and subtraction number sentences for sums through 18 and minuends through 9 (e.g., 13 - _ = 8).

Concept 4: Analysis of Change
Analyze change in a variable over time and in various contexts.
PO 1. Identify the change in a variable over time (e.g., an object gets taller, colder, heavier).
PO 2. Make simple predictions based on a variable (e.g., a child's height from year to year).

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Strand 4: Geometry and Measurement

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Concept 1: Geometric Properties
Analyze the attributes and properties of 2- and 3- dimensional shapes and develop mathematical arguments about their relationships.
PO 1.   Compare attributes of 2-dimensional shapes (square, rectangle, triangle, and circle).   PO 2.   Recognize congruent shapes.   PO 3.   Recognize line(s) of symmetry for a 2-dimensional shape.

Concept 2: Transformation of Shapes
Apply spatial reasoning to create transformations and use symmetry to analyze mathematical situations.
PO 1.   Recognize same shape in different positions (flip/reflection).

Concept 3: Coordinate Geometry
Specify and describe spatial relationships using coordinate geometry and other representational systems.
(Grades 3-HS)

Concept 4: Measurement - Units of Measure   - Geometric Objects
Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements.
PO 1.   Identify the type of measure (e.g., weight, height, and time) for each attribute of an object.   PO 2.   Select the appropriate U.S. customary measure of accuracy: • length – inches, feet, yards, miles,   • capacity/volume – pints, quarts, and   • mass/weight – ounces.   PO 3.   Tell time to the quarter hour using analog and digital clocks.   PO 4.   Determine the passage of time using units of days and weeks within a month using a calendar.   PO 5.   Select the appropriate tool to measure the given characteristic of an object.

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PO 6.   Measure a given object using the appropriate unit of measure:
- length – inches, miles,
- capacity/volume – pints, quarts, and
- mass/weight – ounces.

PO 7.   State equivalent relationships:
- 12 inches = 1 foot,
- 60 minutes = 1 hour,
- 24 hours = 1 day,
- 7 days = 1 week,
- 12 months = 1 year,
- 100 pennies = 1 dollar,
- 10 dimes = 1 dollar, and
- 4 quarters = 1 dollar.

Strand 5: Structure and Logic

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Concept 1: Algorithms and Algorithmic Thinking

Use reasoning to solve mathematical problems in contextual situations.

PO 1.   Create contextual problems that require addition or subtraction with one- or two-digit numbers.

Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof

Evaluate situations, select problem-solving strategies, draw logical conclusions, develop and describe solutions and recognize their applications.

PO 1.   Identify the concepts *some, every*, and *many* within the context of logical reasoning.

PO 2.   Identify the concepts *all* and *none* within the context of logical reasoning.